

In the Claims

Claims 1-252 (canceled).

253. (new) A radio frequency identification device comprising:

an integrated circuit including a transmitter and a receiver, the integrated circuit being adapted to be coupled to a battery, and further including a comparator comparing the voltage of the battery with a predetermined voltage and generating a low battery signal if the voltage of the battery is less than the predetermined voltage, the integrated circuit further including a band gap voltage generator configured to generate a reference voltage, the predetermined voltage being the reference voltage produced by the band gap voltage generator.

254. (new) A radio frequency identification device in accordance with claim 253 wherein the transmitter selectively transmits the low battery signal using a radio frequency signal.

255. (new) A radio frequency identification device comprising:

an integrated circuit including a transmitter and a receiver, the integrated circuit being adapted to be coupled to a battery, and further including a comparator comparing the voltage of the battery with a predetermined voltage and generating a low battery signal if the voltage of the battery is less than the predetermined voltage, the integrated circuit further including a band gap voltage generator configured to generate a reference voltage, the predetermined voltage being the reference voltage produced by the band gap voltage generator, the integrated circuit being configured to respond to commands received by the receiver from an interrogator, the integrated circuit further including a status register having a value indicating whether battery voltage is less than the predetermined voltage, and the transmitter being configured to transmit the value of the status register in response to a command received by the receiver.

256. (new) A radio frequency identification device in accordance with claim 255 wherein the transmitter selectively transmits the low battery signal using a radio frequency signal.

257. (new) A radio frequency identification device comprising:

an integrated circuit including ROM, a processor, a transmitter and a receiver, the ROM, the transmitter and receiver being coupled to the processor, the integrated circuit having a power input terminal configured to be coupled to a battery;

a wake-up circuit configured to periodically activate the receiver, the wake-up circuit being coupled to the receiver and the processor and periodically waking the receiver using a sleep interval derived by the processor from received commands, the wake-up circuit being configured to determine when a valid command is being received and to supply electrical power from the battery to the processor in response thereto;

a power-up circuit configured to provide a power-up signal in response to determination of reception of a valid interrogation signal by the wake-up circuit, the power-up signal being reset in response to the processor completing a wake-up program stored in ROM including resetting of the wake-up circuit; and

a low battery detection circuit configured to be coupled to the battery and configured to provide a signal indicative of battery voltage having fallen below a predetermined limit in response to the power-up signal being reset and the battery voltage having fallen below the predetermined limit, the low battery detection circuit having an output coupled to the processor for setting a data bit indicative of battery status responsive to resetting of the power-up signal.

258. (new) The radio frequency identification device of claim 257, wherein the low battery detection circuit comprises:

- a band gap voltage generator configured to generate a predetermined voltage at a reference output;

- a voltage divider coupled to the power input terminal and having an output terminal, the voltage divider being configured to provide a scaled voltage representative of battery voltage;

- a comparator having first and second inputs and an output, the first input being coupled to the band gap voltage generator reference output, the second input being coupled to the voltage divider output terminal, the comparator being configured to compare the scaled voltage with the predetermined voltage and to generate a low battery signal when the voltage from the battery is less than the predetermined voltage;

- a latch having an input coupled to the comparator output and having an output; and

- a status register having an input coupled to the latch output, the status register being configured to accept the data bit indicative of low battery status and to supply the data bit indicative of battery status to the processor for formation of a status message to be transmitted in response to a received status request by the receiver.

259. (new) A radio frequency identification device in accordance with claim 257 wherein the integrated circuit responds to commands received by the receiver from an interrogator, wherein the integrated circuit comprises a status register having a value indicating when the low battery detection circuit determines that battery voltage is less than the predetermined voltage and wherein the transmitter transmits the value of the status register in response to a command received by the receiver after setting of the data bit indicative of battery status.

260. (new) A radio frequency identification device in accordance with claim 259 wherein the transmitter selectively transmits the low battery signal using a radio frequency signal responsive to the data bit indicative of battery status.

261. (new) A radio frequency identification device comprising:

an integrated circuit including a processor, a transmitter and a receiver, the transmitter and receiver being coupled to the processor, the integrated circuit having a power input terminal configured to be coupled to a battery;

a power-up circuit configured to provide a power-up signal in response to determination of reception of a valid interrogation signal, the power-up signal being reset when the processor completes a wake-up routine; and

a low battery detection circuit configured to be coupled to the battery and configured to provide a signal indicative of battery voltage having fallen below a

predetermined limit in response to the power-up signal being reset, the low battery detection circuit being configured to set a data bit indicative of battery status responsive to resetting of the power-up signal.

262. (new) A radio frequency identification device of claim 261, wherein the low battery detection circuit comprises:

a band gap voltage generator configured to generate a predetermined voltage at a reference output;

a voltage divider coupled to the power input terminal and having an output terminal, the voltage divider being configured to provide a scaled voltage representative of battery voltage; and

a comparator having first and second inputs and an output, the first input being coupled to the band gap voltage generator reference output, the second input being coupled to the voltage divider output terminal, the comparator being configured to compare the scaled voltage with the predetermined voltage and to generate a low battery signal when the voltage from the battery is less than the predetermined voltage.

263. (new) A radio frequency identification device of claim 262, further comprising:

a latch having an input coupled to the comparator output and having an output; and

a status register having an input coupled to the latch output, the status register being configured to accept the data bit indicative of low battery status and to supply the data bit indicative of battery status to the processor for formation of a status message to be transmitted in response to a received status request by the receiver.

264. (new) A radio frequency identification device of claim 261, further comprising a wake-up circuit configured to periodically activate the receiver, the wake-up circuit being coupled to the receiver and the processor and periodically waking the receiver using a sleep interval derived by the processor from received commands, the wake-up circuit being configured to determine when a valid command is being received and to supply electrical power from the battery to the processor in response thereto.

265. (new) A radio frequency identification device of claim 261 wherein the integrated circuit is configured to respond to commands received by the receiver from an interrogator, wherein the integrated circuit comprises a status register having a value indicating when the low battery detection circuit determines that battery voltage is less than the predetermined voltage and wherein the transmitter transmits the value of the status register in response to a command received by the receiver after setting of the data bit indicative of battery status.

266. (new) A radio frequency identification device in accordance with claim 262 wherein the transmitter selectively transmits the low battery signal using a radio frequency signal responsive to the data bit indicative of battery status.

267. (new) A method of operating a radio frequency device comprising:
coupling an integrated circuit including ROM, a processor, a transmitter and a receiver to a battery, the ROM, the transmitter and receiver being coupled to the processor;

selectively supplying electrical power from the battery to the receiver at predetermined intervals by control signals from a wake-up circuit;

determining, by a wake-up circuit coupled to the processor and receiver, when a valid command is being received and supplying electrical power from the battery to the processor in response thereto;

providing a power-up signal from a power-up circuit in response to determination of reception of a valid interrogation signal by the wake-up circuit;

resetting the power-up signal in response to the processor completing a wake-up program stored in ROM including resetting of the wake-up circuit; and

providing a signal from a low battery detection circuit indicative of battery voltage having fallen below a predetermined limit in response to the resetting, the low battery detection circuit having an output coupled to the processor for setting a data bit indicative of battery status responsive to resetting of the power-up signal.

268. (new) A method of operating a radio frequency device in accordance with claim 267, further comprising periodically waking the receiver using a sleep interval derived by the processor from received commands.

269. (new) A method of operating a radio frequency device in accordance with claim 267, further comprising:

generating a predetermined voltage at a reference output by a band gap voltage generator;

providing a scaled voltage representative of battery voltage;

comparing the scaled voltage with the predetermined voltage and to generate a low battery signal when the voltage from the battery is less than the predetermined voltage; and

supplying the data bit indicative of battery status from the latch to the processor for formation of a status message to be transmitted in response to a received status request by the receiver.

270. (new) A method of operating a radio frequency device in accordance with claim 267 and responding, using the integrated circuit, to commands received by the receiver from an interrogator, wherein the integrated circuit comprises a status register having a value indicating when the low battery detection circuit determines that battery voltage is less than the predetermined voltage and further comprising transmitting, by the transmitter, the value of the data bit in response to a command received by the receiver after setting of the data bit indicative of battery status.

271. (new) A method of operating a radio frequency device in accordance with claim 267 further comprising selectively transmitting, by the transmitter, the value of the data bit using a radio frequency signal.

272. (new) A method of operating a radio frequency device comprising:
coupling an integrated circuit including a processor, a transmitter and a receiver to a battery, the transmitter and receiver being coupled to the processor;
selectively supplying electrical power from the battery to the receiver at predetermined intervals by control signals from a wake-up circuit coupled to the receiver and the processor;

determining, by the wake-up circuit, when a valid command is being received and supplying electrical power from the battery to the processor in response thereto;

providing a power-up signal from a power-up circuit in response to determination of reception of a valid interrogation signal by the wake-up circuit;

resetting the power-up signal when the processor completes a wake-up routine including resetting of the wake-up circuit; and

providing a signal from a low battery detection circuit indicative of battery voltage having fallen below a predetermined limit in response to resetting, the low battery detection circuit having an output coupled to the processor for setting a data bit indicative of battery status responsive to resetting of the power-up signal.

273. (new) A method of operating a radio frequency device in accordance with claim 272, further comprising:

providing a predetermined voltage at a reference output of a band gap voltage generator;

providing a scaled voltage representative of battery voltage;

comparing the scaled voltage with the predetermined voltage and to generate a low battery signal when the voltage from the battery is less than the predetermined voltage; and

supplying the low battery signal to the processor.

274. (new) A method of operating a radio frequency device in accordance with claim 272, further comprising:

latching the data bit in a latch having an input coupled to the comparator output and having an output;

accepting the data bit from the latch output in a status register, the status register being configured to accept the data bit; and

supplying the data bit indicative of battery status to the processor for formation of a status message to be transmitted in response to a received status request by the receiver.

275. (new) A method of operating a radio frequency device in accordance with claim 272, further comprising:

periodically activating the receiver by a wake-up circuit using a sleep interval derived by the processor from received commands;

determining when a valid command is being received by the wake-up circuit; and

supplying electrical power from the battery to the processor in response thereto.

276. (new) A method of operating a radio frequency device in accordance with claim 272, wherein the integrated circuit responds to commands received by the receiver from an interrogator, wherein the integrated circuit comprises a status register having a value indicating when the signal from the low battery detection circuit indicates that battery voltage is less than the predetermined voltage; and

transmitting, by the transmitter, a signal indicating the value of the status register in response to a command received by the receiver after setting of the data bit indicative of battery status.

277. (new) A method of operating a radio frequency device in accordance with claim 273, further comprising selectively transmitting the low battery signal using a radio frequency signal responsive to the data bit indicative of battery status.